# The Use Of Combinations Of Caries Preventive Procedures

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## Abstract:

There are now a number of different approaches to preventing dental caries available to the clinician. Caries preventive methods are frequently used in combination. This paper reviews the potential effectiveness of combinations of preventive methods. Three groups of studies are reviewed; combinations of fluoride procedures; fluoride and fissure sealants; chlorhexadine and other agents. The review indicates that there is considerable benefit to be derived from using more than one fluoride procedure. Further research is required in the effectiveness of combining chlorhexadine with other agents. The most promising combination programme currently appears to be the use of fluoride with fissure sealing. The relevance of combination therapy for adults needs to be investigated.

The goal of this paper is to discuss the evidence for the efficacy of combination of caries preventive procedures. Procedures for the control of dental caries may be divided into those, which are community based, and those aimed at individual patients. In the case of the latter, procedures include fluorides in various forms, fissure sealing, plaque control, dietary choice and saliva stimulation. The success of many of these approaches depends on the co-operation of the patient e.g. plaque control and dietary choice, hence education of patients is also a strategy used to control caries. In most cases clinicians will adopt a combination of control measures when treating patients.[1] In this paper three groups of studies which investigated combinations of caries preventive procedures will be reviewed.

- Combinations of fluoride procedures
- Fluorides and fissure sealants
- Chlorhexidine and other agents

Studies that are quoted in this paper have been selected to illustrate the potential of combinations of preventive procedures in the control of dental caries.

## STUDIES OF COMBINATIONS OF FLUORIDE PROCEDURES

The effectiveness of daily supervised toothbrushing with a 0.76 per cent MFP dentifrice combined with seven, six-monthly topical applications of APF solution containing 1.23 percent F, preceded by prophylaxis with an APF paste was reported in 1976.[2] The DMFS increment in the study group was 31 percent less than that recorded in the control. Since only two groups participated in this study the relative contributions of

the different fluoride procedures to the caries reductions achieved could not be ascertained. The anti-cariogenic effects of combinations of stannous fluoride solutions, toothpastes and prophylactic pastes were reported during the 60s.[3-5] Subsequently it was shown that the combined use of the stannous fluoride toothpaste and the APF topical solution provided greater anti-cariogenic benefits than either used alone.[6] The caries inhibiting effect of the unsupervised home use of an MFP toothpaste and an APF gel applied twice a year both individually and in combination was investigated in a large scale clinical trial among children resident in London and the Isle of Wight.[7] The results showed that subjects receiving the combination therapy had significantly lower three-year caries increments. The use of 0.76 percent MFP toothpaste and 0.05 percent NaF daily fluoride mouthrinse did not result in any additional benefit compared with using either product by itself.[8] The authors suggested that the additional affect may have been diluted since toothbrushing and rinsing took place immediately following each other and the rinsing only lasted 30 seconds. In light of current knowledge of the method of action of fluoride in the control of dental caries, and the need to maintain the ambient level of fluoride in the oral cavity throughout the day to obtain maximum benefit, the authors' observations appear appropriate.

## STUDIES OF COMBINATIONS OF FLUORIDE SYSTEMS AND FISSURE SEALANTS

A number of different caries preventive agents were investigated among children residing in a fluoridated community in Michigan, US.[9] The children were randomly assigned to a treatment group or an education group. The former received dietary

counselling and oral hygiene education in classrooms. Sealants were applied every six months to the occlusal surfaces of all teeth as well as the replacement of lost sealants. APF gel was applied every six months for four minutes. Children in the education group received oral hygiene education only. Children in the study group experienced considerably less caries over the three-years of the study; however due to the design of the study it is not possible to ascertain the contribution of each of the different preventive procedures. Similar findings were recorded in other studies in the US[10] and Finland.[11] In a two-year study[11] the effectiveness of a combined fluoride rinsing and sealant program in first permanent molars amongst seven to nine year old children was investigated and almost complete elimination of caries in the study group was recorded. The National Survey of Children's Dental Health in Ireland, 1984 showed that over 80 percent of caries in 12 year olds was contributed by first and second permanent molars and that a high proportion of lesions in these teeth was confined to occlusal surfaces.[12] Hence a combined fluoride mouthrinsing/sealant program was instigated among 8-13 year old children resident in a non-fluoridated area.[13] The children in the test group had their first and second molars sealed and they rinsed every two weeks with 0.2 percent solution of NaF. In the case of fissure sealing, only those children considered at high risk of developing caries were included (those with evidence of caries in deciduous or permanent anterior teeth and those with caries in one or more permanent molars). The control group received routine dental care available in the locality at the time. The results were impressive and the authors concluded that this concentrated preventive approach for high risk children was highly successful. However, due to the design of the study used it is not possible to establish the relative contributions of the different caries preventive

methods. Some of the caries reductions recorded were in the pits and fissures of permanent molars indicating that the sealants were the main contributors to the benefits seen. However, the study only lasted two years and previous work has shown that fortnightly mouthrinsing programs need to be in operation for at least three years to show an effect.[14] An evaluation of a combined sealant and fluoride program in Virginia, US was published in 1995.[15] The fluoride program consisted of a weekly rinse with a 0.2 percent NaF solution, a daily 2.2 mg NaF tablet, and ad libitum brushing with a fluoride containing toothpaste at home. Caries data recorded in 1987, four years after the program began were compared with corresponding data obtained in 1983 before the program started. The mean DMFS scores in 1987 were 51 percent lower than those recorded in 1983. The reduction between 1983 and 1987 was particularly noticeable in pits and fissures. A similar study design was adopted in an evaluation of a dental caries preventive program in Guam.[16] The preventive program included a school-based fluoride mouthrinse program, a clinic-based pit and fissure sealant program and community water fluoridation, phased in over a 13 year period. Substantial reduction in the prevalence of dental caries were recorded but as in the U.S. study it is not possible to directly attribute reductions to the preventive procedures introduced.[15] A field trial of a preventive program consisting of a weekly one-minute mouthrinse with a 0.2 percent solution of NaF, and an annual application, replacement or repair of sealants on first and second permanent molars together with an annual oral hygiene education program was conducted amongst 12-13 year olds in Australia.[17] The control group received the oral hygiene education program only. While 70 percent of the reduction in caries levels found

could be attributed to pit and fissure lesions due to the design of the study it is not possible to assess the contribution of individual preventive procedures.

## STUDIES OF COMBINATION OF CHLORHEXIDINE AND OTHER AGENTS

The majority of studies on the use of chlorhexidine in the control of dental caries have been based in Northern Europe. A total of 124 patients aged 50-60 years participated in a study conducted in Sweden.[18] Patients with low salivary secretion rate and buffering capacity and high numbers of mutans streptococci and Lactobacilli in the test group received a special caries preventive program during the first year of the study. This mostly consisted of dietary counselling, topical fluoride application in the dental clinic and fluoride mouthrinsing or fluoride gel treatment at home together with use of one percent chlorhexidine gel in the clinic. Subjects in whom bacteriological levels in saliva did not improve were given repeat preventive regimens. Subjects in the control group and also the non-risk patients in the test group received preventive treatment as deemed necessary by their dentist, mostly consisting of oral hygiene instruction, topical application of 2 percent NaF or fluoride varnish and dietary information. The mean DFS increment in the high risk patients in the test group was 0.19 compared with 1.67 among high risk patient in the control group. The effectiveness of periodic use of chlorhexidine-fluoride mouthrinses with or without strontium (Sr), was assessed in a study which lasted over a period of two years and nine months and involved Finnish children aged 11 years with high DMFS scores.[19] The subjects were divided into four groups. Group 1 served as a control. Group 2 rinsed twice a day every third week with a solution containing 0.05 percent chlorhexidine gluconate and 0.04 percent NaF. For the third group the rinsing

solution contained 500 ppm Sr during the first and second year and 15 ppm Sr during the last six months, in addition to chlorhexidine and fluoride. In the fourth group the rinsing solution contained only 0.05 percent chlorhexidine gluconate. The mean DMFS increments in the four groups were 3.8, 2.5, 3.5 and 3.4 respectively. While the difference between these means were not significant the authors concluded that there was a trend towards a lower caries incidence in the group using chlorhexidine / fluoride solution (Group 2). In Sweden a study was conducted to measure effectiveness of a gel containing one percent chlorhexidine and 0.2 percent NaF on the salivary levels of mutans streptococci in mothers of one year old children and on the subsequent colonization by mutans streptococci in the oral cavity of their children over the subsequent three years.[20] Caries incidence in the children was also investigated. The gel was applied simultaneously to both jaws by biting on standard trays for a period of five minutes. The gel was applied three times a day on two consecutive days, twice a year for the duration of the study. The results showed that a reduction of maternal salivary mutans streptococci tended to delay colonisation in the children's primary dentition with a concomitant decline in caries incidence. The effect of semi-annual applications of a chlorhexidine-fluoride varnish mixture on approximal caries in 12 year-old Swedish children compared to a regular fluoride varnish also has been conducted.[21] Children included were those that had one or more approximal enamel/dentine carious lesion or filling on a bitewing radiograph. The results showed that both groups experienced low levels of caries during the three years of the study and that there was no additive effect achieved by the chlorhexidine/fluoride varnish over and above fluoride varnish alone. A three-year study of the effectiveness of combining chlorhexidine gel treatment with

fissure sealant application among 13-14 year old children in Sweden was investigated.[22] In the test group children with high salivary levels of mutans streptococci were treated with a gel containing 1 percent chlorhexidine digluconate. After instruction, this treatment was then performed at home once a day for 14 days. The study lasted for three years during which saliva samples were taken every four months from all the children in the test group. Children in whom the mutans streptococci counts did not fall below 2.5 x $10^5$ CFU were treated at home with the chlorhexidine gel again for 14 days. After the first four months of the study, those children in the test group whose mutans streptococci levels had fallen below 2.5 x $10^5$ CFU/ml of saliva had fissure sealants applied to sound occlusal surface of molars and premolars. Children in the test and control groups rinsed with a 0.2 percent solution of NaF once a fortnight during school-term. There was a substantial reduction in the caries increment in the test group. However the addition of fissure sealing had only marginal influence on caries activity.

## DISCUSSION AND RECOMMENDATIONS

There is little information on the pattern of use of caries preventive procedures by practising dentists and dental auxiliaries throughout the world.[1,23,24] Substantial differences between Denmark, Norway, Iceland and Sweden in the choice of preventive strategies selected for risk patients were recently reported.[1] It is recommended that further studies in this field be undertaken in order to ascertain what combinations of caries preventive therapies practitioners use. It is further recommended then that the evidence to support these combinations be established.

It is interesting to note that during the past ten years few studies have been conducted on the caries preventive effect of combinations of fluoride therapy. The studies reported to date would seem to suggest that there is indeed considerable benefit to be derived from using more than one fluoride procedure, especially for patients with high levels of dental caries. Further studies in this area are required.

The most promising combination program studied to date would appear to be the use of fluorides and fissure sealing. One study, for example, reported complete elimination of caries during the two years of the study.[10] The relevance of this combination therapy among older patients needs to be assessed. In the last national survey of adult dental health in the Republic of Ireland it was shown that there was a substantial increase in caries prevalence in subjects in the age groups 16-25.[25] It was postulated that this increase was due to the dramatic decline in caries in subjects up to the age of 15 leaving more surfaces at risk. Further research on the usefulness of a combination of fluoride therapy and sealing among adolescents and young adults is needed.

It is interesting that most of the work on combination therapy using chlorhexidine have been undertaken in Northern Europe. Theoretically, the use of chlorhexidine in high risk patients with high levels of mutans streptococci in saliva has a sound theoretical base and the effectiveness of this approach in controlling dental caries would appear to have been established in the studies reported. Further research is required to establish the merits of adding other preventive procedures to the chlorhexidine regimen.

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